

## **Farmer Entangled in Rotating Driveline Shaft of Portable Feed Grinder/Mixer**

### **SUMMARY**

A 46-year-old male hog farmer (the victim) died after becoming entangled in the rotating driveline shaft of a portable feed grinder/mixer. The grinder was connected to a tractor equipped with a power take-off (PTO), which powered the grinder driveline and pulley system. The victim was working alone in the barnyard, grinding shelled corn for animal feed. He apparently had completed the grinding activities and was standing on ice-covered soil near the rotating driveline. Then, he either slipped and fell onto the driveline, or his clothing was caught and pulled by protruding bolts on the hub of the grinder pulley. He was spun around the driveshaft, and portions of his clothing were entangled on the driveshaft and torn from his body. A family member approached the site of the incident, noticed the victim's clothing whirling on the shaft and went to the farmhouse to call a neighbor for assistance. A neighbor arrived and shut off the PTO and the tractor. Meanwhile, the sheriff and EMS were summoned, and responded within eight minutes. The coroner's office was contacted, and pronounced the victim dead at the scene. The FACE investigator concluded that, to prevent similar occurrences, farm machine/equipment operators should:

- **identify machinery/equipment components that are PTO driven, and ensure that appropriate guards, recommended by the manufacturer or dealer, are installed.**
- **turn off machinery/equipment before attempting to make repairs, adjustments, or perform maintenance.**

### **INTRODUCTION:**

On February 4, 1995, a 46-year-old hog farmer died of injuries he received from being entangled in a PTO-driven driveline shaft of a portable grain grinder. On February 6, the Wisconsin FACE investigator was notified of the fatality by a newspaper article. The State FACE field investigator and a safety specialist from the National Institute for Occupational Safety and Health conducted an investigation of this incident on April 10, 1995. The incident was reviewed with the victim's wife, the clothing worn by the victim

at the time of the incident was examined, a report and photos were obtained from the sheriff/ coroner, and the death certificate and state climatologist reports were reviewed. The victim owned the hog and grain farm that he operated with the help of his wife and parents. He had operated the farm for more than fifteen years and had done similar work on other farms from the time he was in high school. This incident was the first serious injury or fatality that had occurred on the farm since the victim had purchased the property. He had worked for a farm equipment dealer, where he received on-the-job training in repairing and maintaining agricultural machines and equipment. The victim had used the portable grain grinder/mixer at least weekly since it was purchased from another farmer several years before the incident. There was no written safety program for the farm, and it is unknown if the victim received written safety information or an equipment operation and maintenance manual for the grinder.

## **INVESTIGATION:**

On the day of the incident, the victim began doing barn chores about 7:00 A.M., wearing a T-shirt, trousers, a quilted nylon jacket, quilted coveralls, socks, boots and cotton gloves. The outside temperature on that day reached 35°, with a low of 14° and no precipitation. Around 11:00 A.M., he hitched a tractor to the portable grain grinder and positioned the equipment near grain bins in the frozen, icy barnyard. The tractor was equipped with a PTO that could be engaged and operated while the tractor was stationary; it is unknown if the PTO master shield was in place at the time of the incident. The grain grinder had a driveline that transmitted rotational power from the tractor PTO to pulleys and drive belts on the grinder. A universal joint connected the driveline to the hub of a 24" diameter pulley. A metal housing guard designed to cover and prevent contact with the pulleys and drive belts was in place at the time the victim purchased the feed grinder, but the guard had been removed and not replaced at some point before the incident. It is unknown if a driveline guard had been in place at the time the victim purchased the grinder, however the driveline shaft was unguarded at the time of the incident.

The farmer connected the tractor PTO to the grinder driveline and ran the tractor with the PTO engaged to grind the corn. Before the incident, the grinder grain chute had been placed in its storage position so it is assumed that the victim had completed the feed grinding operation. Although there were no witnesses to the incident, it appears that the victim was standing on the icy ground facing the grain grinder with the rotating driveline shaft on his left side, and either slipped and fell onto the shaft, or was reaching across the

driveline and the hub of the pulley to disengage a clutch mechanism on the grinder when his sleeve became entangled on a protruding bolt of the pulley hub, and he was pulled around the driveshaft.

The victim's stepson had been in the farmhouse, and approached the barnyard at noon to offer assistance with chores. He noticed pieces of clothing going around the driveshaft, ran to the house, and called a neighbor for help. The neighbor arrived at the scene within several minutes, disengaged the PTO from the grinder driveshaft and turned the tractor off. Meanwhile, the stepson called the sheriff's office to summon EMS. The first respondent from that call was an EMS provider/deputy coroner, who noted the victim's severe injuries and called the coroner to the scene. The coroner arrived at 12:34 P.M., and found the victim lying face up with his torso across the tongue of the mixer and under the driveline shaft. Portions of the victim's jacket and shirt were wrapped around the shaft, and one boot and glove were found on each side of the tractor. The coroner pronounced him dead at the scene. No autopsy was done.

## **CAUSE OF DEATH:**

The death certificate listed the cause of death as massive trauma.

## **RECOMMENDATIONS/DISCUSSION**

**Recommendation #1: Farm machinery/equipment operators should identify machinery/equipment components that are PTO driven, and ensure that appropriate guards, recommended by the manufacturer or dealer, are installed.**

Discussion: In this case, the driveline and the pulley and belt system were unguarded at the time of the incident. A metal housing guard that gave protection from contact with the pulleys and drive belts was in place at the time of purchase of the feed grinder. At some point between the purchase of the feed grinder and the time of the incident, the guard had been removed and not replaced. Unguarded moving shafts, belts, chains, etc., expose workers to entanglement resulting in injuries and even death. If the original guards had been reinstalled, or retrofit guards installed, the incident may have been avoided. To prevent

installation of an inadequate guard, consult with the manufacturer or dealer before fitting machinery/equipment with any type of guard.

**Recommendation #2: Farm machine/ equipment operators should turn off machinery/equipment before attempting to make repairs, adjustments, or perform maintenance.**

Discussion: One scenario suggests that since the feed grinding process had been completed, the victim may have been reaching across the unguarded driveline and pulley assembly to disengage the clutch mechanism on the feed grinder when his coat sleeve became entangled in the rotating parts. PTO driven machinery/equipment requires a large amount of energy or power transferred from a motor or engine to the machine/equipment. This transfer of power is accomplished through various mechanisms including rotating shafts and/or a combination of belts and pulleys. As a result of rotating shafts and components while machines are running, workers are exposed to hazardous situations if they attempt to make repairs, adjustments, or perform maintenance to machinery/equipment while in operation. If the machinery/ equipment had been stopped before the victim attempted to reach for the clutch, the fatality may have been prevented.